Implementing an Effective Triage System in Emergency Medical Services

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Abstract

The objective of this applied research project was to research the current triage systems in use in the United States today. While the National Incident Management System (NIMS) has standardized response to disasters, no such standardization exists in providing triage to victims of mass casualty incidents. The research conducted was descriptive in nature and attempted to describe the problem by answering three questions. Is the use of triage systems by emergency medical service providers during a mass casualty incident necessary to properly care for victims? Are triage systems in place today a help or a hindrance to the care that victims receive after a mass casualty incident? Finally, should the United States adopt one triage system as it has with NIMS?

In order to answer these questions, the author compared the EMS response to two similar mass casualty incidents- the Columbine School shooting and the Virginia Tech shooting. The author also conducted a small-scale study in a controlled environment in which providers were asked to categorize simulated victims according to a formal triage system.

The results of the study showed that over-triage is common when using a formal triage system and that patient outcomes may be even better when no formal triage system is used at all. Recommendations were made that further study be conducted as technology improves, that implementation of specific triage systems continue to be left up to regional jurisdictions, and that providers increase their experience and training, which has shown to have positive effects on victim outcome in mass casualty incidents.

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In the ten years since the Terrorist attacks of 2001, great strides have been taken to integrate the first responders of communities around the nation into a single force that is theoretically capable of responding to any incident, whether it is around the corner or several states away. While this integration is nowhere near complete, it is becoming more of a reality every day in communities around the United States. Emergency responders around the nation have been tasked with changing the way they respond to incidents in order to be ready to work with agencies from multiple jurisdictions in order to ensure a positive outcome by those effected by any disaster.

In order for efficient response to occur, emergency responders must speak the same language in disaster situations. This is especially true since disasters are low frequency, high-risk events in which missteps by individual responders can jeopardize the success of the entire operation. While great strides have been made in ensuring that incident command is standardized across the board, the concept of mass casualty triage is still not standardized across the United States.

Currently, there is no systematic way to measure an individual agencies level of preparedness to respond to a disaster (Schwartz, 2010). There is, however, a new set of education standards promulgated by the National Highway Traffic Safety Administration (NHTSA) that is supposed to standardize EMS education across the United States. The new National Emergency Medical Services Education Standards (NEMSES) were published in 2009 and are currently being implemented by many states. While these new education standards include an expanded curriculum over the previous Department of Transportation (DOT) EMS training standards, one area that has not been expanded on to any great extent is that of disaster preparedness.

The NEMSES standards do require that EMS students receive training in three facets of disaster response. These areas are incident command, multiple casualty incidents (MCI) and MCI due to terrorism and disaster (NHTSA, 2009). Students are required to learn how to establish and work within the incident command system and to perform triage, re-triage, make a destination determination, and recognize cumulative and post traumatic stress.

In order to achieve a level of competence in incident command, the instructional guidelines that accompany the standards require students to pass the Federal Emergency Management Agency's (FEMA) Independent Study (IS) 100 and 700, which teach the basics of the National Incident Management System (NIMS). This ensures that all EMS students are exposed to the same NIMS terminology; however, the problem is that there is no such standardization for which triage procedure or terminology must be used in a mass casualty incident (MCI) or disaster. This allows state EMS offices, local jurisdictions, individual medical directors or even EMT instructors to decide which triage system to teach new EMS students.

The purpose of this descriptive research is to examine the current triage systems in use in the United States today and answer the following research questions: Is the use of triage systems by EMS providers during an MCI necessary to properly care for victims? Are triage systems in place today a help or a hindrance to the care that victims receive after an MCI? Finally, should the United States adopt one triage system as it has with NIMS?

Background and Significance

Disaster triage, like much of prehospital emergency medicine is borne out of war. During the Napoleonic Wars in the 1790's, Baron Dominique-Jean Larrey developed a rudimentary triage system during the Campaign of the Rhine (Loftus, 2007). In Larrey's system, horse drawn carriages took the soldiers most in need of treatment, regardless of rank, to a battlefield hospital

that was located away from the battle (Mitchell, 2008). Since the treatment was based upon the severity of injury rather than rank, the morale of the French troops improved (Loftus, 2007).

In the United States, the massive casualties suffered by Union Army during the First Battle of Bull Run prompted Congress to authorize the appointment of the First Surgeon General in 1862 in an attempt to organize the medical corps (Loftus, 2007). Dr. William Hammond was appointed to the post of Surgeon General in April of 1862 (Loftus, 2007). One of his Chief Medical Officers, Dr. Jonathon Letterman, who served as Medical Director of the Army of the Potomac based a triage system on Larrey's triage system (Loftus, 2007). Letterman's system included systems that are in place today, including providing aid to troops in the field, the use of field hospitals, and evacuation of the injured to larger hospitals after field stabilization (Loftus, 2007).

World War I led to another step forward in the development of triage (Loftus, 2007). Casualties were collected, separated in "lyers" and "walkers" and transported to a casualty collection zone near the front line (Loftus, 2007). Those needing a higher level of care were then transported to an "evacuating zone" (Loftus, 2007). From there, soldiers were sent to appropriate facilities based on their needs, for example, those needing bandaging were sent to an "Advanced Dressing Station" and those needing surgery went to an "Advanced Operating Station", which was an early field operating room (Loftus, 2007).

As medicine continued to advance, battlefield triage and treatment also evolved. In World War II, the "echelon system" was developed (Loftus, 2007). The first echelon of care was provided on the battlefield by specially trained combat medics (Loftus, 2007). Medics evacuated those in need of further care to "aid stations" near the front lines, which were staffed with physicians and could provide a higher level of care and get less-injured soldiers back to the front

lines and send those needing a higher level of care on to the second echelon (Loftus, 2007). The second echelon was a medical company capable of providing surgical services and holding soldiers for up to seventy-two hours (Loftus, 2007). Those needing an even higher level of care were evacuated to the third echelon, which were "Combat Support Hospitals" also known as "Mobile Army Surgical Hospital" (MASH) units (Loftus, 2007). These mobile units could be set up and evacuated quickly and provide a high level of acute care (Loftus, 2007). Those needing further definitive care were then evacuated to the "fourth echelon" which was outside the combat zone and provided definitive care and rehabilitation services (Loftus, 2007).

Advancements in battlefield medicine cut mortality rates from 8.5% in World War I to 1.7% in the Vietnam Conflict and cut the time from injury to definitive care from up to eighteen hours in World War I to sixty-five minutes in Vietnam (Loftus, 2007). These advancements also cut the deaths from disease from over seven percent in the Civil War to less than one tenth of one percent in World War II (Loftus, 2007).

In the United States, civilian EMS development has advanced along the same lines as battlefield medicine. Early ambulances provided little or no care and were often operated by funeral directors (Bledsoe, Porter, & Shade, 1994). Modern EMS truly started to evolve after the publication of a National Academy of Sciences paper called Accidental Death and Disability: The Neglected Disease of Modern Society which recommended that a new kind of allied health professional be trained to provide care and transportation to sick and injured people, much like combat medics (Bledsoe, Porter, & Shade, 1994).

In the 1980's, civilian EMS systems began to develop trauma care systems based upon research that showed that trauma patients had better outcomes when they were cared for at facilities that were properly staffed and equipped to handle trauma patients (Ciottone et al.,

2006). This evolved into study of the best way to handle multiple trauma patients during MCIs when resources are scarce and trauma centers may not be available for every trauma patient (Cittone et al., 2006). Over the last thirty years, several trauma triage systems have been developed for EMS that espouse that they are easy for EMS providers to learn and remember, properly identify victims that need the most advanced care, and most efficiently utilize scarce resources. These systems include the Simple Triage and Rapid Treatment (START), the Trauma Sieve, the Triage Index, and the Circulation, Respiration, Abdomen, Motor, and Speech (CRAMS) score among others (Cittone et al., 2006).

After September 11, 2001, standardization of response became a priority across all emergency services in the United States. This led to the development of the National Incident Management System (NIMS), which requires the use of standard terminology, typing of resources, and standardized incident command use by all emergency responders including EMS personnel (United States Department of Homeland Security, 2003).

Despite the attempt to standardize EMS response, the profession remains under the control of each state and, in most states, local medical directors have a great deal of control over the scope of practice of the EMS personnel that they oversee (National Highway Traffic Safety Administration, 2008). This system allows local medical directors to tailor protocols to the hazards that local EMS providers are likely to encounter in their response areas. For example, EMS providers that operate in an area that has a chemical manufacturing facility in its first due might need expanded protocols to properly treat patients exposed to the chemicals manufactured there. Local medical direction can authorize the use of antidote drugs that may otherwise not be allowed under overarching state or national protocols.

While this system works well for most EMS systems on a day-to-day basis, disaster response requires a different approach. This is due to the fact that during disaster response, EMS responders from multiple jurisdictions, states, and perhaps even regions of the nation must work together in a coordinated fashion (Ciottone et al., 2006). This requires all EMS providers working on the disaster scene to use the same terminology and provide care that can easily be continued as the victims move through the disaster medical system. Currently, there is no standardization of MCI triage systems to ensure that this happens.

The Mount Weather Fire Department has a direct organizational stake in MCI response not just as an operational fire and EMS department, but also as a federal entity within the Department of Homeland Security and Federal Emergency Management Agency. Recommendations from this study will apply to the EMS community as a whole, which will impact the Mt. Weather Fire Department from an operational standpoint. As with any federal mandate, all federal entities are directly impacted as well as state and local responders.

Study of this topic directly relates to the Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM) course as evidenced in the course's student manual that lists life safety as the first priority at any emergency scene (Federal Emergency Management Agency, 2010). The manual goes on to say, "This includes rescuing endangered civilians, treatment of the injured, and provision for the safety, accountability, and welfare of responding personnel" (United States Fire Administration, 2010, pg. SM 1-33). Additionally, study of this topic directly relates to the United States Fire Administration's goal to "improve the fire and emergency services' capability for response to and recovery from all hazards" (United States Fire Administration, 2011, strategic plan)

Literature Review

Even though triage systems came into being in the 1980's, they were not studied much until EMS disaster response became a topic of interest after September 11, 2001 and again after Hurricane Katrina in 2005. In August 2005, the Journal of Academic Emergency Medicine published two articles regarding disaster triage. The first is a commentary piece in which the authors looked for scientific evidence that any triage system is better than any other (Cone and MacMillan, 2005). The article states that "Roughly half a dozen mass-casualty systems have been developed and are in use around the world for this purpose, and sort patients into the familiar immediate, delayed, minimal, and expectant categories" (Cone and MacMillan, 2005, p. 739). The article goes on to say, "Surprisingly, there has been very little research validating or even evaluating these systems. We simply have no idea whether any of them actually work as intended, or have any effect on patient outcome even if used as designed" (Cone and MacMillan, 2005, p. 739).

This article is a call to action which serves as a good start point for this research. In the time since this article was published, some scientific study has emerged on the topic, which will be discussed in this paper. This commentary is related to the second article in the journal relating to triage. This article puts forth a new triage system developed by Dr. William Sacco et al. The Sacco triage method is based on a mathematical formula that Dr. Sacco's team developed to take into account things that START does not take into account. Specifically, Dr. Sacco's team cites eight limitations that exist in START and other triage systems similar to START (Sacco, Navin, Fiedler, Wadell, Long, and Buckman, 2005). These limitations include that the outcomes from the use of these systems can not be replicated, resource availability is not taken into account, victims' injuries in each category can vary widely, and limited resources are poorly utilized due

to the most severe victims being treated first despite the fact that they are most likely to die (Sacco et al., 2005).

Additionally, Sacco's team claims that factors such as prognosis, deterioration, and types of injuries received are not taken into consideration by the systems currently in use, which are critical in determining survivability of the incident (Sacco et al., 2005). In order to account for these factors, the Sacco Triage Method (STM) is based upon mathematical algorithms that categorize disaster victims based upon field analysis of their respirations, pulse, and motor response (Sacco et al., 2005). These raw scores are recorded on triage tags and attached to each surviving patient and then fed into a computer at the command post or a dispatch center which runs the algorithm and prioritizes the patients automatically (Sacco et al., 2005).

The STM is fascinating and as computers become more prevalent in disaster response it is possible that it will become a viable option for triage of disaster victims. Presently, the STM has a few things working against it. First, providers are not familiar with the system. Without wide distribution of materials and training on the system, EMS systems are not likely to embrace the change. Second, many communities do not have the technology to deploy to a scene in order to execute the algorithms. Finally, it has not been implemented on any actual disasters in order to prove that it will work as it is supposed to in a real disaster (Sacco et al., 2005).

One issue with standardized triage systems do not take into account is the experience of the provider performing the triage. A study of the response to the July 2005 London subway bombings found that the training of the provider conducting the triage affected the number of patients that were over-triaged (Alwin, Konig, Brennan, Davies, Walsh, and Brahi, 2006). Over-triage occurs when less severely injured victims are placed into a higher category of triage than they should be wasting critical resources (Sasser, 2006). In contrast, under-triage occurs when

more severely injured victims are placed into a lower category than they should be, delaying potentially life-saving care (Sasser, 2006).

Alwin et al. found that the mortality rate of only fifteen percent in the London Bombing was partially attributed to the fact that triage was conducted in most cases by nineteen highly trained prehospital physicians and eight paramedics at two of the four bombing sites (2006). Even with these highly trained individuals providing triage, the over-triage rate of victims was thirty-three percent, which is significantly lower than the average of sixty seven percent (Alwin et. al., 2006). This increase in triage accuracy helped conserve the resources needed for the highest level of care for those who needed it most (Alwin et. al., 2006). Triage that was conducted by ambulance service personnel and bystanders at the initial two bombing sites resulted in an over-triage rate of eighty-two percent (Alwin et. al., 2006).

London the triage sieve, which separates patients into four categories, similar to START, and the study's authors recommend the implementation of a simplified triage system to speed up the assessment of MCI victims (Alwin et. al., 2006). The author states, "In the initial chaos of a mass casualty situation, triage errors will happen. A disaster response plan must identify and reduce the consequence of these errors" (Alwin et. al., 2006, p. 2224).

Experience of providers is a common theme in other triage studies. Michael Baker writes "Triage is a technical art that requires situational awareness, decisiveness, and clinical expertise" (2007, p. 232). He goes on to say, "The most experienced physician with casualty care experience and a surgical background should perform triage in a disaster setting" (Baker, 2007, p. 232). While this may be ideal, it is far from practical, especially in the initial phases of a disaster; however it is practical for "the most senior rescuers [to] step up and identify themselves and their skill sets" (Baker, 2007, p. 233). While many rescuers may not have experience in a

disaster situation, their overall experience makes them the best candidates to oversee triage (Baker, 2007).

Dr. Robert O'Connor suggests provider judgment may be the best predictor of victim survival. "EMT judgment is as accurate as these three scoring systems in identifying patients who were severely injured" (O'Connor, 2006, p. 309). This suggests that a formal system may not be necessary when it comes to disaster triage. While it is evident that further study is needed, it is difficult to prove any system is better than any other (or none at all) without more data collected on actual disaster scenes. Fortunately, disasters are a rare event and many providers will never have to use a formal disaster system in a disaster situation.

Procedures

In order to answer the research questions posed by this paper, a multi-faceted approach was taken. First, two similar mass casualty incidents (MCI) were studied. The first of these MCIs is the Columbine High School shooting, which took place in Littleton, Colorado on April 20, 1999 and resulted in the murder of thirteen individuals by two students at the school. The second MCI studied is the Virginia Tech shooting that occurred on April 16, 2007 and resulted in the murder of 32 individuals and was perpetrated by a single gunman. While these incidents are certainly not identical, the after-action reports do provide a great deal of information about the EMS effort to save the lives of those injured in both attacks.

In order to compare how well the EMS providers triaged patients in each of the incidents and how it affected the outcome, this study will look at the EMS response to each of these incidents and attempt to ascertain whether triage differences were able to give the victims at one scene an advantage over the responders at the other scene. During the eight-year span between

the incidents the September 11, 2001 terrorist attacks and Hurricane Katrina shed much light on the subject of EMS disaster response, which possibly affected the response and outcome.

Secondly, a group of twenty EMTs were shown a film produced by the Virginia Office of EMS that showed a simulated explosion at a garage and a variety of patients ranging from green to black that the participants needed to categorize based upon the actors' presentation and the vital signs given to students. The participants had no official preparation prior to watching the video and had to categorize patients based upon their memory of how to triage patients. Two actor portrayals of each of the four levels of START triage were randomly selected and each of the twenty respondents' category selections was correlated to study how appropriately the participants triaged each of actors. The Commonwealth of Virginia has officially adopted START as its official triage system for adults and JumpSTART as its official pediatric triage system (Virginia Office of EMS, 2008). Since each of the respondents was a Virginia certified EMT-B, the categories were based upon START classifications. There were no pediatric actors in the film.

There are several limitations worth noting regarding this research. First, the case study events occurred eight years apart. This allowed for lessons learned from the Columbine shooting to become a part of the Virginia Tech responders' body of knowledge without formal training. Also, there is no way to prove exactly how much MCI training each individual responder to each scene received other than the fact that in the Virginia Tech shooting, each EMT-B on scene had to complete Mass Casualty Incident Management Level I in order to be certified to the EMT-B level (Virginia Office of EMS, 2008). These case studies were chosen due to their similarities and the depth of study on the EMS response that has been conducted on each of them. That being

said, they are not ideal cases from a triage point of view due to the necessary coordination with law enforcement which limited EMS providers' access to patients.

The study conducted in the controlled classroom setting is also limited in the fact that it is a small sample size of providers from a single fire department. Randomization was not possible and validation was not conducted on any other sample populations. The providers studied were all certified in Virginia and all had the benefit of MCI training at some point in their career. No advanced level providers were studied.

Results

The Columbine High School Shooting occurred April 20, 1999 when two students, Eric Harris and Dylan Klebold opened fire on teachers and students and planted dozens of improvised explosive devices (IEDs). Ultimately, the perpetrators killed 15 people, including themselves, and injured 160 to the point of needing to be triaged by EMS. As one of the first tragedies of its kind, much has been studied regarding all aspects of the crime and the public safety response to the event. Rather than rehash the details of the crime, this case study will focus upon triage.

The Littleton, Colorado EMS system is based in the Littleton Fire Department. Every firefighter working for the department is cross-trained as an Emergency Medical Technician-Basic (EMT-B) or as a higher trained EMT-Paramedic (EMT-P). Each ambulance is staffed with at least one EMT-B and one Paramedic (Mell & Sztanjnkrycer, 2005). At the time of the shooting, basic level EMS personnel in Colorado were required to be trained to the 1994 EMT-B national standard curriculum as promulgated by the United States Department of Transportation (USDOT). Paramedics were trained to the 1985 EMT-P national standard curriculum as

promulgated by the DOT and were in the process of upgrading to the 1998 curriculum through continuing education.

Triage was a major challenge at the Columbine shooting. Due to the dangerous nature of the scene, EMS responders were not able to access the bulk of the injured students until a special weapons and tactics (SWAT) team entered the building and deemed it safe for EMS personnel to enter (Erickson, 2001). While initially, it was difficult for EMS providers to access patients for triage, the EMS leadership on scene was able to order enough resources, including private ambulance services and mutual aid units, to ensure that triage and transport was swift and efficient when access to patients was granted (Mell & Sztanjnkrycer, 2005). Therefore, rather than having to decide which patients get few resources, patients were able to be transported as soon as they were extricated from the school without regard to the extent of their injuries (Mell & Sztanjnkrycer, 2005). Every victim who made it to a hospital alive survived the attack in no small part due to the actions of the EMS providers and the decisions made by the incident commanders (Erickson, 2001). “Separating a relatively low number of severely injured persons from literally a sea of uninjured people was the biggest triage challenge faced by the emergency responders at Columbine High School” (Mell & Sztanjnkrycer, 2005, Triage).

A formal triage system was never used in the Columbine massacre; however the patient care has been praised and the outcome of one hundred percent survival of all victims who were reached by EMS personnel suggests that the operation was not hindered by the lack of a formal triage system. In this case, it appears that establishment of a formal triage system could have possibly hindered the response by adding an unnecessary step to patient care due to the fact that truly injured patients were being extricated from the scene as law enforcement and EMS personnel were able to access them rather than in one large group (Erickson, 2001).

On April 16, 2007, a despondent student named Seung-Hui Cho carried out a plot that resulted in the murder of 32 people and injuring of 17 more at Virginia Tech. This shooting spree occurred in two different locations and bears many similarities to the Columbine tragedy (Tridata, 2009). Cho began his shooting spree by killing two people in West Ambler Johnston Hall, a dormitory, before completing his spree in Norris Hall, a classroom facility, while classes were in session (Tridata , 2009).

The EMS response to the Virginia Tech shooting has been described as “excellent and the lives of many were saved. The challenges of systematic response, scene and provider safety, and on-scene and hospital patient care were effectively met. Responders are to be commended. The results in terms of patient care are a testimony to their medical education and training for mass casualty events, dedication, and ability to perform at a high level in the face of the disaster that struck so many people.” (Tridata, 2009, p. 101).

The primary EMS responders in the Virginia Tech shootings were the Virginia Tech Rescue Squad (VTRS) which is a volunteer organization made up of 38 students at Virginia Tech with EMS training ranging from EMT-B through EMT-P, and the Blacksburg Volunteer Rescue Squad, which also has personnel with training ranging from EMT-B through EMT-P (Tridata , 2009). In addition to the basic EMT training required in the Commonwealth of Virginia, the Virginia Office of EMS also requires all EMT-B’s to complete Mass Casualty Incident Management Level I which is an eight hour program addressing how to properly triage victims of an MCI according to START triage principles (Virginia Office of EMS, 2008).

In this event, the EMS responders on scene initiated START triage protocols (Kaplowitz, Reece, Hershey, Gilbert, and Subbarao, 2007). Of the twenty-five patients triaged by EMS, six were categorized “red”, ten were categorized “yellow” and the other nine were categorized

"green" (Kaplowitz et al., 2007). All patients categorized as "green" were treated at the scene (Kaplowitz et al., 2007). One of the twenty-five patients treated and transported by EMS died resulting in a total mortality rate of four percent (Kaplowitz et al., 2007). While this statistic is encouraging, one statistic that is not is that sixty-nine percent of the patients triaged by EMS were over-triaged (Kaplowitz et al., 2007). One patient was under-triaged in the field during this incident (Kaplowitz et al., 2007).

In a controlled setting, EMS providers more easily recognize which category MCI victims fall into. When shown a video in a classroom setting, triage categorizations were much more accurate. Eight of the actors shown in the video were chosen by the author to study the ability of the EMTs to properly categorize the "patients" after a simulated explosion. Two of the actors were portrayed as deceased or black, two as "walking wounded" or green, two as delayed or yellow, and two as immediate or red. All twenty EMTs properly identified the deceased, immediate, and green tag patients without a problem. Fourteen of the twenty, or seventy percent, properly identified both of the yellow tag patients.

Four of the providers (twenty percent) categorized one of the two yellow tag patients incorrectly and two providers (ten percent) categorized both of the yellow tag patients incorrectly. One hundred percent of the time, the patients were over-triaged as red by the providers. The yellow, or delayed, category is the only category that any of the providers had any issue with, easily picking up on the actors that needed to be placed in the other categories.

Analysis of these two events as well as the controlled setting study proves that use of a formal triage system during an MCI is not necessary to properly care for victims. The EMS response to Columbine did not utilize a formal triage system and had a mortality rate of zero percent among those victims who were alive when EMS personnel reached them while the EMS

responders at Virginia Tech did use a formal triage system and had a four percent mortality rate. It also shows that over-triage is very common when a formal triage system is utilized.

This tendency to over-triage when using a formal triage system also shows us that formal triage systems are actually a hindrance to the care that MCI victims receive after an event. Under-triage and over-triage both lead to higher mortality rates among the critically injured after an MCI (Armstrong and Frykberg, 2007). In fact, the sixty nine percent over-triage rate at the Virginia Tech massacre correlated to a mortality rate of twenty percent among the critically injured patients (Kaplowitz et al., 2007).

Based upon these case studies, there is no evidence to suggest that the federal government should step in to require or even endorse a specific triage system. The lack of a formal triage system did not hinder the EMS response to the Columbine shooting. Had a formal system been mandated, the response might have been hindered.

Discussion and Implications

While this study is by no means exhaustive, it does fall in line with the small number of other studies that exist on this subject. Over-triage seems to be the most common mistake made by EMS providers. This is particularly true at the yellow or delayed, category. Sixty nine percent of the victims Virginia Tech shooting were over-triaged as red rather than yellow while only four percent were under–triaged as yellow and recategorized at the hospital as red (Kaplowitz et al., 2007).

This is also true of the London bombings, which had a total over-triage rate of sixty-four percent (Alwin et al., 2006). It is interesting to note that the over-triage rate by basic level providers at two of the sites had a total over-triage rate of eighty-two percent while the rate of

over-triage at the two sites at which triage was conducted by personnel with higher levels of training was only thirty-three percent (Alwin et al., 2006).

Over-triage appears to be the most common mistake, but one that seems to diminish with training and experience (Baker, 2007). Unfortunately, there is no guarantee that the first responders into a scene will be the most experienced. Therefore it is important to ensure that an experience triage officer is appointed by incident command at the earliest possible time if a formal triage system is going to be utilized (Cittone, 2006). A physician perhaps best fills this position, but since physicians are often in short supply on disaster scenes, it should be noted, "Nurses, dentists, and physicians assistants with training and experience have traditionally performed triage in exemplary fashion" (Baker, 2007, p. 232).

Perhaps the most important lesson learned in this study is that disaster scenes are constantly evolving, as should the responders' approach to how to handle them. The incident command system works because it is flexible. The triage systems appear to not work as well because they are not flexible enough to let the most experienced providers apply their knowledge to affect the outcome of the patient. This study shows that rigidity is the enemy of disaster response and can lead to higher mortality rates.

The biggest implication for the Department of Homeland Security and the federal government as a whole is that no attempt to mandate a specific triage system nation wide should be undertaken. While NIMS has proven itself useful for all-hazards response, current triage systems do not lend themselves to national adoption due to their lack of flexibility and the possibility of higher mortality rates associated with their implementation. The decision on how to triage MCI patients should be left up to each region in order to allow for specifically tailoring response to their geography, population, and resources. There is no great discrepancy in

terminology that would hinder providers from outside the area from providing triage in an unfamiliar area.

Recommendations

Currently, more research needs to be done on triage and EMS disaster response in general. There is currently no triage system that has proven to be effective in actual disasters. This is particularly true in large disaster situation in which the numbers of casualties reach the thousands or more (Alwin et al., 2006). It is important that EMS providers maintain the ability to operate "outside the box" on disaster scenes. Any attempt to standardize triage at this time would tie the hands of EMS providers and potentially harm victims.

As technology advances, this subject should be revisited regularly. Such systems as the Sacco Triage Method may prove to be a boon to EMS disaster response in the future. Other advancements, like ultrasound devices in the field, telemedicine advancements, and portable lab devices may give EMS providers a level of ability that they currently do not have. Due to the expense associated with many of these advancements, they will probably not be seen in the field for many years, but pilot programs should be instituted whenever possible.

The most important recommendation that can be made right now is that EMS systems increase their experience with disaster response in general by conducting MCI drills, recurrent training, and working with hospitals, if necessary, to schedule rotations so providers can gain patient care experience. Experienced providers tend to triage MCI victims better than inexperienced providers. Drills and exercises give providers a chance to participate in the incident command system and to meet other personnel and see how they provide patient care, which adds to the provider's knowledge base and can be beneficial not just during disasters but during day to day EMS operations as well.

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